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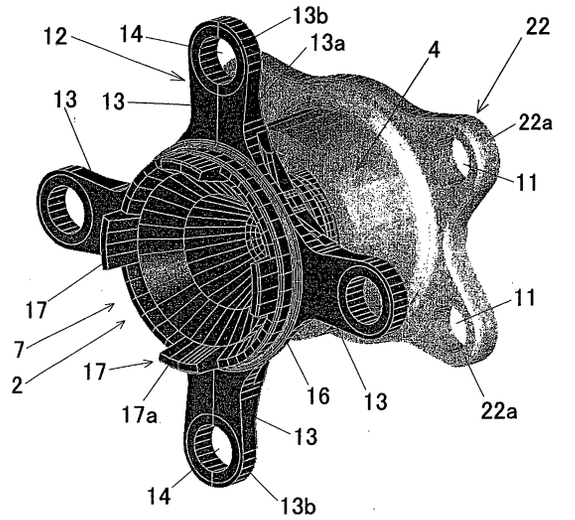
(54) Wheel support bearing assembly

(57) To reduce the weight of the wheel support bearing assembly without sacrificing the strength, the wheel support bearing assembly for rotatably supporting a vehicle wheel relative to a vehicle body structure includes a hub axle (2) formed with a radially outwardly extending hub flange (12). This hub flange (12) has an inner peripheral portion and a remaining wall portion other than the inner peripheral portion, and the remaining wall portion thereof is constituted by a plurality of radially outwardly extending ribs (13) each formed with a bolt insertion hole (14). The hub axle (2) also includes a brake pilot area (16) extending outwardly from an outboard face of the hub flange (12) for guiding an inner peripheral surface of the brake rotor (41). At least the root diameter (D1) of at least an inboard face of each rib (13) is chosen to be equal to or smaller than the outer diameter (D2) of the brake pilot area (16).

Fig. 4A



EP 1 500 524 A3

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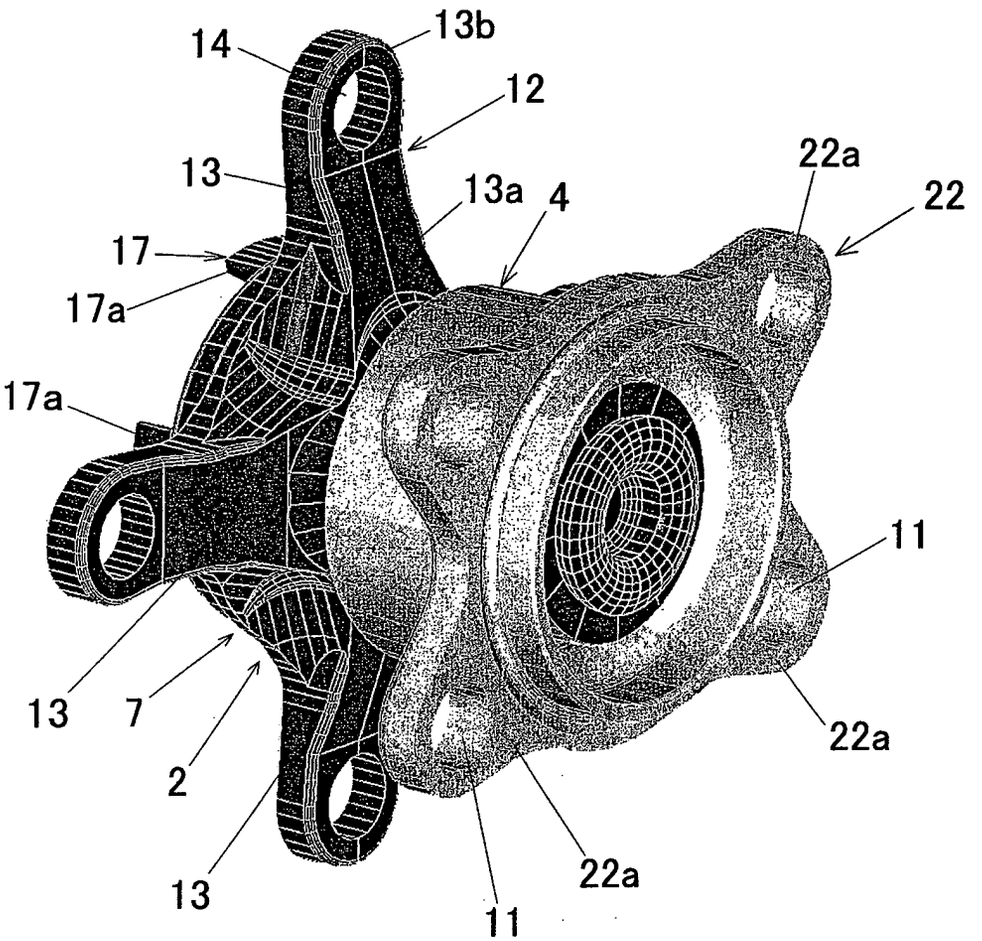
Fig. 4B



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EUROPEAN SEARCH REPORT

Application Number
EP 04 01 7197

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
D,A	PATENT ABSTRACTS OF JAPAN vol. 2003, no. 08, 6 August 2003 (2003-08-06) & JP 2003 094905 A (KOYO SEIKO CO LTD), 3 April 2003 (2003-04-03) * abstract; figures 2,3 *	1-7	B60B27/00
A	PATENT ABSTRACTS OF JAPAN vol. 1996, no. 04, 30 April 1996 (1996-04-30) & JP 07 317755 A (NTN CORP), 8 December 1995 (1995-12-08) * abstract; figures 1,3,6-8 *	1-14	
A	EP 0 834 670 A (SKF IND SPA) 8 April 1998 (1998-04-08) * abstract; figure 3 *	1-7	
A	GB 2 351 950 A (NSK RHP EUROP TECHNOLOGY CO LT) 17 January 2001 (2001-01-17) * abstract; figure 3 *	1-7	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
A	US 5 890 567 A (PETE ET AL) 6 April 1999 (1999-04-06) * claim 1; figures 1-10 *	8-14	B60B
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A	US 5 727 886 A (HATA ET AL) 17 March 1998 (1998-03-17) * figures 1-3 *	8-14	

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	10 August 2005	Bolte, U

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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Application Number
EP 04 01 7197

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☒ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

1-14

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 04 01 7197

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7

A wheel support bearing assembly, wherein the wheel mounting hub flange is formed by a plurality of radially outwardly extending ribs, the root diameter of each of the ribs as measured at the inboard surface thereof is chosen to be equal to or smaller than an outer diameter of the brake pilot area.

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2. claims: 8-14

A wheel support bearing assembly, wherein at least the wheel pilot area is divided into a plurality of circumferentially spaced wheel pilot segment.

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3. claim: 15

A wheel support bearing assembly, wherein the knuckle pilot area is divided into a plurality of circumferentially spaced knuckle pilot segments.

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4. claims: 16-18

A wheel support bearing assembly, wherein the hub flange is constituted by a plurality of radially outwardly extending ribs and wherein a root thickness of a root portion of each of the ribs of the hub flange as measured in a direction axially of the inner member is chosen to be equal to or greater than a width of the root portion of each rib as measured in a direction conforming to a direction of rotation of the inner member.

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5. claims: 19-21

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 04 01 7197

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

A wheel support bearing assembly, wherein a longitudinal sectional shape of a region ranging from a thick walled base portion of the hub flange to a hub bolt mounting portion adjacent an outer periphery of the hub axle is so chosen that an inboard side face is inclined to render a wall thickness at an outer peripheral portion to be smaller than that at a center portion and a gradient shape of the inboard side face is in a form of a two-stage gradient shape made up of a first gradient surface area adjacent the center and a second gradient surface area adjacent the outer periphery, that is inclined at an angle smaller than that of inclination of the first gradient surface area, which is connected with the first gradient surface area by means of a connecting arcuate transit surface area, and wherein the connecting transit arcuate surface area in the inboard side surface is a surface which has been hardened by an induction hardening process.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 01 7197

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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10-08-2005

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82